

# Data Manipulation

Arithmetic  
Operators

# Arithmetic Operators

## Addition and Subtraction

Subtraction can be simulated by addition and negation like in 2's complement notation  $7 - 5$  would be  $7 + (-5)$  which means the binary of 7 will be added to binary of 5.

| Problem in base 10                                  | Problem in two's complement                                  | Answer in base 10 |
|---|--|-------------------|
| $\begin{array}{r} 3 \\ + 2 \\ \hline \end{array}$   | $\begin{array}{r} 0011 \\ + 0010 \\ \hline 0101 \end{array}$ | 5                 |
| $\begin{array}{r} -3 \\ + -2 \\ \hline \end{array}$ | $\begin{array}{r} 1101 \\ + 1110 \\ \hline 1011 \end{array}$ | -5                |
| $\begin{array}{r} 7 \\ + -5 \\ \hline \end{array}$  | $\begin{array}{r} 0111 \\ + 1011 \\ \hline 0010 \end{array}$ | 2                 |

# Arithmetic Operators

## Multiplication

- ✓ Multiplication is repetitive addition
- ✓ For example 8 multiplied by 3, we will add 8 three times

# Arithmetic Operators

## Division

- ✓ Can be achieved through subtraction
- ✓  $15 \div 5$
- ✓ Some small CPUs are designed to have just add, or just add and subtract to do all arithmetic operations.

# Arithmetic Operators

## Remember

- ✓ If its ~~subtraction~~ as 2's complement, it is straight forward
- ✓ If its save in floating point notation, then you know you need to use mantissa, exponent and sign bit.
- ✓ Although both are additions but both have different workout.

# Summary

## Arithmetic Operations

- ✓ Addition and subtraction
- ✓ Multiplication is repetitive addition
- ✓ Division is repetitive subtraction
- ✓ Remember how the data was stored.